Astronomical Telescopes and Instrumentation Symposium

Abstract Submission

1. **Conference Code:** AS07

2. **Conference Title:** Space Telescopes and Instruments
   Conference Chairs: Pierre Y. Bely and James B.Breckinridge

3. **Abstract Title:** Inflation-deployed camera

4. **Author Listing:** James B.Breckinridge, Jet Propulsion Laboratory, California Institute of Technology, MS 126-244,4800 Oak Grove Drive, Pasadena, CA 91109, 818/354-6785, 818/393-4053, <James. B.Breckinridge@jpl.nasa.gov>; Aden B. Meinel and Marjorie P. Meinel, Jet Propulsion Laboratory, California Institute of Technology, 1600 Shoreline Drive, Santa Barbara,CA93109, 805/965-4762, 805/957-0113, <ameinel@earthlink.net>.

5. **Presentation:** Oral

6. **Abstract Text:**

Within the framework of the new technologies of inflation-deployed space structures, we develop the rationale for ultralightweight, large-aperture camera systems. Optical system requirements are derived for an inflation-deployed camera, and the technology development needs in membrane mirrors, two-stage optics, and inflation-deployed structures and systems are described. This is a high-risk, very high payoff project whose specific implementation is strongly dependent on the success of a comprehensive technology development program. We are proceeding with a four-phase program: 1) Develop a 0.5-meter-class clear-aperture inflation-deployed camera test bed for hardware and software component technology development and deployment in a ground-based de-mountable vacuum test bed. 2) Develop a 2-meter-class clear-aperture camera system that is space qualified and ready for a flight test bed demonstration of the inflation-deployed camera. 3) Develop a several-meter-class clear-aperture camera system focused on achieving significant scientific measurement objectives for Earth, planetary or astrophysics applications. Successful implementation of this program will enable cost savings of 10 to 100 times over conventional space optics systems and will enable the 25-meter-class space-optical systems previously thought to be impossible. Applications for the Planet Mapper mission, planetary orbiter mappers, and stretch technology for NGST and optical communications are discussed.

7. **Key Words:** telescopes, space optics, adaptive optics, membrane mirrors, two-stage optics.

8. **Brief Biography:**

Dr. James B. Breckinridge, B. SC. Physics 1961, Case Institute of Technology, Cleveland; MSC. and Ph.D. Optical Sciences, 1976 Arizona, Tucson, AZ. He is a fellow of the Optical Society of America, the SPIE, The International Society for Optical Engineering, and the Royal Astronomical Society,

London. Dr. Breckinridge was elected president of the SPIE for 1994. In 1995 he was elected to serve on the Council of Scientific Society President's where he was elected to the Board of Directors to serve 1997–9S.

His current position is Program Manager for Advanced Concepts in the Flight Systems Program Office at the Jet Propulsion Laboratory where he has responsibility for Imaging Spectrometers and Space Telescope sensor system programs for several DOI) Offices, the Army, and the Air Force. Dr. Breckinridge is the founding manager of the 60-member optical sciences and application section at JPL and was its Technical Manager for 15 years. He was Optics Technologist for the Observational Systems Division for 3 years. He serves as an invited lecturer and technical expert to several national and international organizations.

Dr. Breckinridge holds an academic appointment in Applied Physics at the California Institute of Technology where he teaches a two-quarter course in Optical System Engineering. Dr. Breckinridge began his career at Zenith Radio as an electron tube engineer, where he developed Image Intensifier and Image Converter tubes for Picker X-ray Corporation.

At the Kitt Peak National Observatory and the University of Arizona, Dr. Breckinridge developed several imaging interferometers which enabled new advanced solar physics and astronomy instruments. Dr. Breckinrid has over 75 technical peer-reviewed open literature papers in optical systems engineering, astronomy, and physical optics of the atmosphere. He holds five patents for innovative optical systems for remote sensing optical instruments. He was the instrument scientist for the NASA space lab ATMOS interferometer for measures of stratospheric trace molecular species and has provided technical support to earth and planetary remote sensing instruments and to space-based astrophysics telescopes and instruments. Dr. Breckinridge has served on several telescope review panels, and DOD and NASA review committees: Hubble Space Telescope Failure Review Board (1 990), NASA Survey of Russian Space Optics Technology (1 992-1 997), SDIO optics planning 1984-88.

Current activities include: Next generation space telescopes, novel imaging spectrometer architectures, sparse aperture telescopes and supporting technology for "quicker, faster, cheaper" sensors, international science and foreign technology policy, and management of complex programs.

Inflation-deployed camera

James B. Breckinridge, Aden B. Meinel, and Marjorie P. Meinel

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109

ABSTRACT

Within the framework of the new technologies of inflation-deployed space structures, we develop the rationale for ultralightweight, large-aperture camera systems. Optical system requirements are derived for an inflation-deployed camera, and the technology development needs in membrane mirrors, two-stage optics, and inflation-deployed structures and systems are described. This is a high-risk, very high payoff project whose specific implementation is strongly dependent on the success of a comprehensive technology development program. We are proceeding with a four-phase program: 1) Develop a 0.5-meter-class clear-aperture inflation-deployed camera test bed for hardware and software component technology development and deployment in a ground-based de-mountable vacuum test bed. 2) Develop a 2-meter-class clear-aperture camera system that is space qualified and ready for a flight test bed demonstration of the inflation-deployed camera. 3) Develop a several-meter-class clear-aperture camera system focused on achieving significant scientific measurement objectives for Earth, planetary or astrophysics applications. Successful implementation of this program will enable cost savings of 10 to 100 times over conventional space optics systems and will enable the 25-meter-class space-optical systems previously thought to be impossible. Applications for the Planet Mapper mission, planetary orbiter mappers, and stretch technology for NGST and optical communications are discussed.

Keywords: telescopes, space optics, adaptive optics, membrane mirrors, two-stage optics.